<u>Remarks:</u>

Reconsideration of the application is requested.

Claims 1, 2, 4, 7-11, 13, 16-17, 19, and 22 remain in the application. Claims 1, 2, 4, 7-11, 13, 16-17, 19, and 22 are subject to examination. Claims 1, 8 and 16 have been amended. Claims 3, 5, 6, 12, 14, 15, 18, 20 and 21 were previously canceled to facilitate prosecution of the instant application.

In item 3 on pages 2-3 of the above-identified Office action, claims 1, 2, 7-11, 16, 17 and 22 have been rejected as being obvious over U.S. Patent No. 5,661,241 to Harth, III et al. (hereinafter Harth) in view of the article by Krautkrämer et al. entitled "Ultrasonic Testing of Materials" (hereinafter Krautkrämer) under 35 U.S.C. § 103.

First, it is noted that claims 1 and 16 have been amended to make it clear that the tubes are made for containing nuclear fuel as recited in the preambles of the claims 1 and 16. The body of claim 8 already recites this feature.

The invention of the instant application is based on the object of measuring layer thicknesses of cladding tubes. On the one hand, one problem is the small diameters of the tubes themselves, which, in all pressurized water reactors and

boiling water reactors, is in the region of 10 mm, and they have a wall thickness of less than 1 mm. In a cladding tube with a wall formed of two layers, the layers are correspondingly thin so that, due to low measurements (dimensions), difficulties arise when determining the layer thickness via ultrasound. On the other hand, cladding tubes for nuclear fuel are <u>always formed</u> of zircaloy. No other material is used worldwide. As evidence we provide an article titled "Zirconium Alloy Fuel Clad Tubing" by Sandvik Special Metals published in December 1989. One can obtain from pages 30 and 31 that a liner layer is <u>metallurgically</u> connected to the base material and that the tubes are exclusively made from zirconium.

Contrary thereto, Harth pertains to the determination of the thickness of a layer connected to the inner side of a nuclear vessel in a <u>non-metallurgical manner</u>, wherein the base material of the vessel and the material of the inner coating clearly vary with respect to their reflection coefficient (see column 5, lines 12-23 and column 10, lines 37-44).

The Examiner is believed to be of the opinion that, in view of the background disclosed in Harth, it is obvious to use the described method of measurement for determining a partial layer thickness in a cladding tube specifically configured for nuclear fuel.

In view of the technological background, Harth outlines a number of known methods of measurement via ultrasound. Column 2, lines 27-32 of U.S. Patent No. 5,329,561 to Desruelles refers to the French reference FR 2,629,586 A, which discloses a method with which layer thicknesses of less than 0.4 mm cannot be determined and which requires ultrasound frequencies not exceeding 20 MB. Furthermore, the '561 patent describes in column 2, lines 39-46, that cladding tubes with layer thicknesses of 0.08 to 0.1 require frequencies in the magnitude of 100 MHz, which would render the execution of a method of measurement of an industrial standard extremely difficult, particularly when considering that the individual layers of a fuel cladding tube only slightly vary with regard to their reflection coefficient (less than 2%).

The Harth patent suggests a method of measurement via ultrasound, with which the thickness of an inner layer of a vessel can be determined, wherein the material of the inner layer and the base material of the vessel clearly differ from each other (see column 10, lines 36-44). The person of average skill in the art would thus hardly assume that the method, described in Harth, would be useful in measuring layers, metallurgically connected with each other, with a thickness in the region of 0.15 mm. Besides that, Harth outlines several times that the suggested method of

measurement via ultrasound is not suitable when the cladding material is metallurgically connected to the base material (see column 1, lines 9-14, column 5, lines 12-23, column 10, lines 10-13, and column 12, line 16). As far as the metallurgical connection of an outer or inner layer in a nuclear fuel cladding tube is concerned the Examiner is of the opinion that this must not necessarily be so. A layer of, for instance, 0.15 mm cannot be applied onto the inner side of a cladding tube in a manner other than a metallurgical manner. U.S. Patent No. 5,329,561 cited in Harth briefly describes in column 1, lines 43-57, the method of producing multi-layered cladding tubes. In such a method of production, a billet formed of an inner and an outer tube is at first extruded and the billet is then rolled out in a so-called pilgrim method to a length of 4 m. The inner and outer tubes of the billet are soldered together (see Sandvik, page 31). Such a production method naturally results in a metallurgical connection between the coating and the base material.

When using the method disclosed in Harth, the person of average skill in the art could, therefore, not have expected an improvement regarding the accuracy of measurement when determining the layer thicknesses of cladding tubes.

Krautkrämer describes on page 291 that it is principally possible to mount a cylindrically-bent surface onto a flat

test head, however, a decline of the measuring sensitivity is connected therewith due to the reduced contact surfaces between the bent surface and the test head. In the case of the cladding tubes in question, this would be counterproductive, because the extremely weak signal at the border between the layers of the cladding tubes would perish in the base noise, and could no longer be recovered by amplification.

Krautkrämer generally pertains to the ultrasound measuring in the case of curved surfaces. Neither multi-layer cladding tubes for fuels are mentioned, nor is it discussed to determine the thickness of layers of such tubes containing a zirconium alloy as is generally used in cladding tubes for nuclear fuels. The problem which the person of average skill in the art faces when determining the layer thickness of such cladding tubes results from the fact that the individual layers formed of almost of the same material and only very weak echoes are received at the interfaces of layers which are in contact with each other. The person of average skill in the art will thus direct his attention to a measuring method which has the highest possible sensitivity. In this regard, the person of average skill in the art, however, gathers from Krautkrämer that with the use of test heads with planar coupling surface, for example for convexly curved surfaces, the disadvantage of a reduced sensitivity is to be accepted

and that corrective measures can be taken by adapting the coupling surface to the work piece surface. The person of average skill in the art dealing with the above problem thus obtains the suggestion from Krautkrämer to use a curved coupling surface instead of a planar surface.

Thus the motivation, hint or suggestion for combining Harth with Krautkrämer is not believed to be obvious.

In item 4 on page 3 of the above-identified Office action, claims 4, 13, and 19 have been rejected as being obvious over U.S. Patent No. 5,661,241 to Harth, III et al. (hereinafter Harth) in view of the article by Krautkrämer et al. entitled "Ultrasonic Testing of Materials" (hereinafter Krautkrämer) and further in view of U.S. Patent No. 5,038,615 to Trulson et al. (hereinafter Trulson) under 35 U.S.C. § 103. Claims 4, 13 and 19 ultimately depend on one of claims 1, 8 or 16. Since amended claims 1, 8 and 16 are believed to be allowable, claims 4, 13 and 19 are also believed to be allowable.

In item 5 on pages 4-5 of the above-identified Office action, claims 1, 2, 7-11, 16, 17 and 22 have been rejected as being obvious over U.S. Patent No. 5,349,860 to Nakano et al. (hereinafter Nakano) in view of the article by Krautkrämer et al. entitled "Ultrasonic Testing of Materials" (hereinafter Krautkrämer) under 35 U.S.C. § 103.

Nakano pertains to the measurement of "clad materials" in steel technology, which denotes a base material made from a low-alloyed carbon steel or low-alloyed steel with a coating from an anti-corrosive metal, such as stainless steel or a nickel-based alloy. Typical low-alloyed carbon steel has a carbon content of 0.8% and manganese in the region of 0.5%. Contrary thereto, rust-free steel contains at least 10.5% chrome and further high contents of nickel, molythen, manganese and copper. Rust-free steel and a nickel-based alloy thus clearly differ from low-alloyed carbon steel with regard to the above-mentioned reflection coefficient. The problem of the cladding tube layers having almost the same materials in fuel rod cladding tubes does not arise there. It is respectfully stated that the Examiner is believed to be incorrect when stating that a steel tube is inherently capable of carrying nuclear fuel. When a cladding tube for nuclear fuel is mentioned in the application, a cladding tube made from zirconium alloy is meant. If such a tube is disposed of several layers, naturally, they all are formed of Zr alloys, the thicknesses of which could hitherto not be determined or only with insufficient accuracy because of their reflection coefficients being almost the same.

This, however, is not the only difference. Nakano uses an ultrasound test head with a frequency of 2-10 MHz, the test

head having a coupling surface, which is adapted to the tube surface. The invention of Nakano and the invention of the instant application thus do not solely differ in that the ultrasound test head with a planar coupling region is adjoined to the tube to be measured. Besides that, the person of average skill in the art would not have taken this into consideration, as outlined above, due to the reduction of the measuring sensitivity when determining the layer thickness of Zr-cladding tubes. In order to further distinguish the invention of the instant application over Nakano, independent claims 1, 8 and 16 have been amended to recite that the high-frequency probe operates at a frequency greater than 40 MHz as recited on page 3, lines 19-22 of the specification of the instant application.

In item 6 on page 5 of the above-identified Office action, claims 4, 13, and 19 have been rejected as being obvious over U.S. Patent No. 5,349,860 to Nakano et al. (hereinafter Nakano) in view of the article by Krautkrämer et al. entitled "Ultrasonic Testing of Materials" (hereinafter Krautkrämer) and further in view of U.S. Patent No. 5,038,615 to Trulson et al. (hereinafter Trulson) under 35 U.S.C. § 103. Claims 4, 13 and 19 ultimately depend on one of claims 1, 8 or 16. Since amended claims 1, 8 and 16 are believed to be allowable, claims 4, 13 and 19 are also believed to be allowable.

In item 7 on pages 5-6 of the above-identified Office action, claims 1, 2, 7-11, 16, 17 and 22 have been rejected as being obvious over U.S. Patent No. 4,991,440 to Pleinis et al. (hereinafter Pleinis) in view of the article by Krautkrämer et al. entitled "Ultrasonic Testing of Materials" (hereinafter Krautkrämer) under 35 U.S.C. § 103.

The method described in Pleinis is based on the same object as the invention of the instant application. The subject matter is the determination of the thickness of a liner layer in cladding tubes for nuclear fuel, i.e. tubes made from zirconium. It is stated in column 1, line 32, that this determination is not possible with conventional methods of ultrasound measurement. It is also described in the mentioned text passage that the signal reflected from the interface of two layers is extremely weak.

Thus a person of average skill in the art, taking the teachings of Krautkrämer and combining them with Pleinis, would further weaken an already weak signal, which can hardly be measured with conventional methods anyway, by using an ultrasound test head with a planar coupling surface, the test head being linked to a considerable loss of sensitivity according to Krautkrämer. Simply put Pleinis teaches away from Krautkrämer. Besides that, it must be taken into consideration that, according to Pleinis, an ultrasound test

head with 10 MHz is used (in contrast to the amended claims being greater than 40 Mhz). Therefore, the invention is not made obvious by Pleinis and Krautkrämer. The person of average skill in the art could not foresee that the coupling of a test head with a flat coupling surface to a cladding tube for nuclear fuel and the use of a high-frequency ultrasound renders the measuring of very thin layers possible without requiring therefor software-like methods for preparation, per se, as used in Pleinis.

In item 8 on page 6 of the above-identified Office action, claims 4, 13, and 19 have been rejected as being obvious over U.S. Patent No. 4,991,440 to Pleinis et al. (hereinafter Pleinis) in view of the article by Krautkrämer et al. entitled "Ultrasonic Testing of Materials" (hereinafter Krautkrämer) and further in view of U.S. Patent No. 5,038,615 to Trulson et al. (hereinafter Trulson) under 35 U.S.C. § 103. Claims 4, 13 and 19 ultimately depend on one of amended claims 1, 8 or 16. Since claims 1, 8 and 16 are believed to be allowable, claims 4, 13 and 19 are also believed to be allowable.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1, 8 and 16. Claims 1, 8 and 16 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as

well because they all are ultimately dependent on claims 1, 8 or 16.

In view of the foregoing, reconsideration and allowance of claims 1, 2, 4, 7-11, 13, 16-17, 19, and 22 are solicited.

The extension fee for response within a period of 2 months pursuant to Section 1.136(a) in the amount of $450.00 in accordance with Section 1.17 is enclosed herewith.

Please charge any other fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

For Applicant

RALPH E. LOCHER
REG. NO. 41,947

REL:kf

October 6, 2005

Lerner and Greenberg, P.A.
Post Office Box 2480
Hollywood, FL 33022-2480
Tel: (954) 925-1100
Fax: (954) 925-1101